

TOSHIBA Photocoupler IRED & Photo-Transistor

# TLP371, TLP372

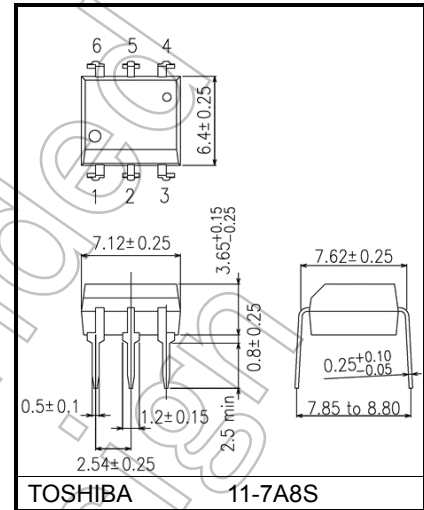
Programmable Controllers  
Telecommunication  
Solid State Relay

Unit: mm

The TOSHIBA TLP371 and TLP372 consists of an infrared emitting diode optically coupled to a Darlington connected photo-transistor which has an integrated base-emitter resistor to optimize switching speed and elevated temperature characteristics in a six lead plastic DIP package.

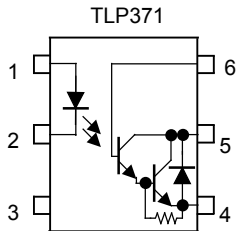
TLP372 has no-base internal connection for high-EMI environments.

- Current transfer ratio : 1000% (min)
- Isolation voltage : 5000 Vrms (min)
- UL-recognized : UL 1577, File No.E67349
- cUL-recognized(TLP371): CSA Component Acceptance Service No.5A  
File No.E67349
- CQC-approved(TLP371): GB4943.1,GB8898 Japan Factory

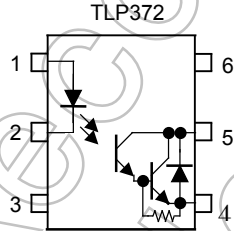


Weight: 0.4 g (typ.)

### Pin Configurations (top view)



- 1 : Anode  
2 : Cathode  
3 : NC  
4 : Emitter  
5 : Collector  
6 : Base



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2 : Cathode  
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6 : NC

Start of commercial production  
1986-03

### Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
LED	Forward current	$I_F$	60	mA
	Forward current derating (Ta ≥ 39°C)	$\Delta I_F/^\circ\text{C}$	-0.7	mA/°C
	Peak forward current (100 μs pulse, 100 pps)	$I_{FP}$	1	A
	Reverse voltage	$V_R$	5	V
	Diode power dissipation	$P_D$	70	mW
	Diode power dissipation derating (Ta ≥ 39°C)	$\Delta P_D/^\circ\text{C}$	-0.81	mW/°C
	Junction temperature	$T_j$	125	°C
Detector	Collector-emitter voltage	$V_{CEO}$	300	V
	Collector-base voltage (TLP371)	$V_{CBO}$	300	V
	Emitter-collector voltage	$V_{ECO}$	0.3	V
	Emitter-base voltage (TLP371)	$V_{EBO}$	7	V
	Collector current	$I_C$	150	mA
	Power dissipation	$P_C$	300	mW
	Power dissipation derating (Ta ≥ 25°C)	$\Delta P_C/^\circ\text{C}$	-3.0	mW/°C
	Junction temperature	$T_j$	125	°C
Storage temperature range		$T_{stg}$	-55 to 125	°C
Operating temperature range		$T_{opr}$	-55 to 100	°C
Lead soldering temperature (10 s)		$T_{sol}$	260	°C
Total package power dissipation		$P_T$	350	mW
Total package power dissipation derating (Ta ≥ 25°C)		$\Delta P_T/^\circ\text{C}$	-3.5	mW/°C
Isolation voltage (AC, 60 s, R.H. ≤ 60 %) (Note 1)		$BVS$	5000	Vrms

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

Note 1: Device considered a two terminal device: Pins 1, 2 and 3 shorted together and pins 4,5 and 6 shorted together.

### Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	$V_{CC}$	—	—	200	V
Forward current	$I_F$	—	16	25	mA
Collector current	$I_C$	—	—	120	mA
Operating temperature	$T_{opr}$	-25	—	85	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

### Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	$V_F$	$I_F = 10 \text{ mA}$	1.0	1.15	1.3	V
	Reverse current	$I_R$	$V_R = 5 \text{ V}$	—	—	10	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	30	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.1 \text{ mA}$	300	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	$I_E = 0.1 \text{ mA}$	0.3	—	—	V
	Collector-base breakdown voltage (TLP371)	$V_{(BR)CBO}$	$I_C = 0.1 \text{ mA}$	300	—	—	V
	Emitter-base breakdown voltage (TLP371)	$V_{(BR)EBO}$	$I_E = 0.1 \text{ mA}$	7	—	—	V
	Collector dark current	$I_{CEO}$	$V_{CE} = 200 \text{ V}$	—	10	200	nA
			$V_{CE} = 200 \text{ V}, T_a = 85^\circ\text{C}$	—	—	20	$\mu\text{A}$
	Collector dark current (TLP371)	$I_{CER}$	$V_{CE} = 200 \text{ V}, T_a = 85^\circ\text{C}$ $R_{BE} = 10 \text{ M}\Omega$	—	0.5	10	$\mu\text{A}$
	Collector dark current (TLP371)	$I_{CBO}$	$V_{CB} = 200 \text{ V}$	—	0.1	—	nA
	DC forward current gain (TLP371)	$h_{FE}$	$V_{CE} = 5 \text{ V}, I_C = 10 \text{ mA}$	—	7000	—	—
	Capacitance (collector to emitter)	$C_{CE}$	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	10	—	pF

### Coupled Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	$I_C/I_F$	$I_F = 1 \text{ mA}, V_{CE} = 1 \text{ V}$	1000	4000	—	%
Saturated CTR	$I_C/I_F(\text{sat})$	$I_F = 10 \text{ mA}, V_{CE} = 1 \text{ V}$	500	—	—	%
Base photo-current (TLP371)	$I_{PB}$	$I_F = 1 \text{ mA}, V_{CB} = 1 \text{ V}$	—	6	—	$\mu\text{A}$
Collector-emitter saturation voltage	$V_{CE(\text{sat})}$	$I_C = 10 \text{ mA}, I_F = 1 \text{ mA}$	—	—	1.0	V
		$I_C = 100 \text{ mA}, I_F = 10 \text{ mA}$	0.3	—	1.2	

### Isolation Characteristics (Ta = 25°C)

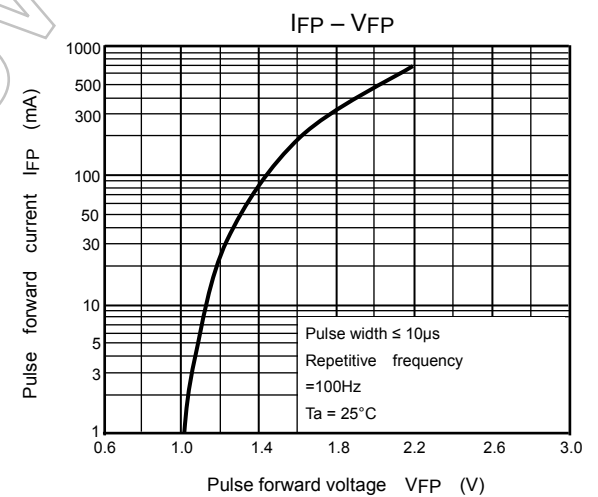
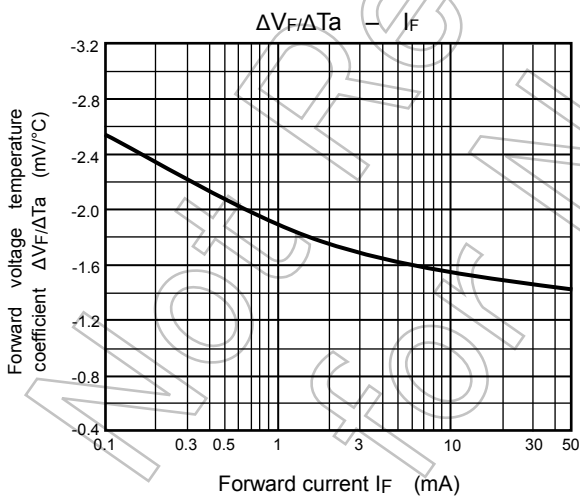
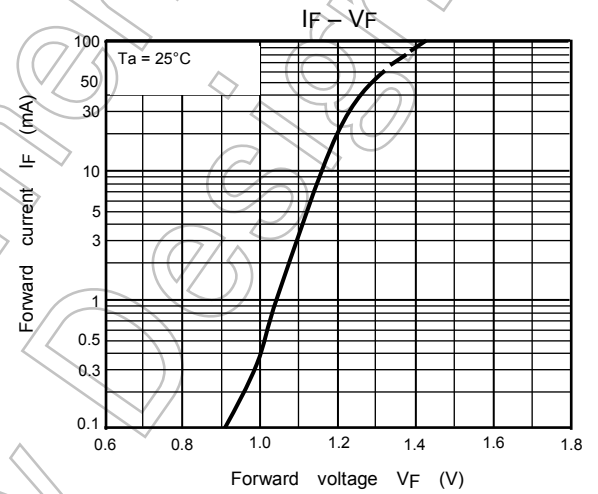
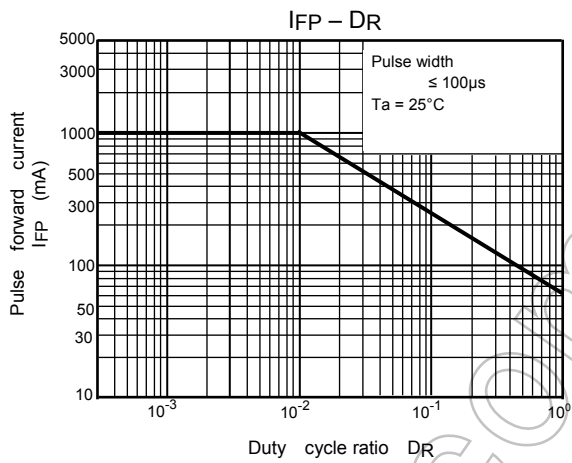
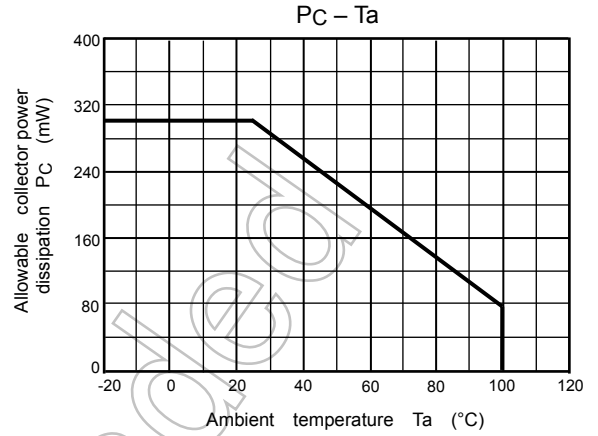
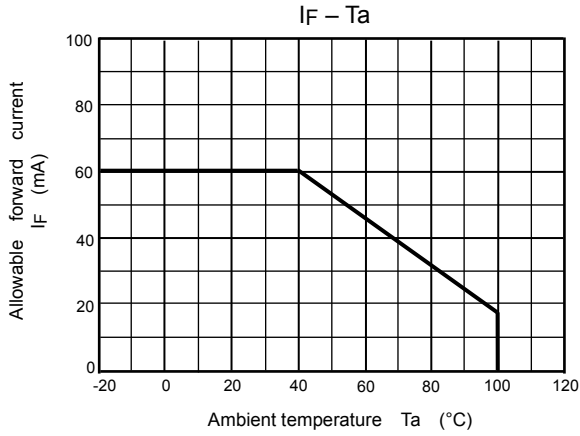
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	Cs	V <sub>S</sub> = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60 %	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 60 s	5000	—	—	V <sub>rms</sub>

### Switching Characteristics (Ta = 25°C)

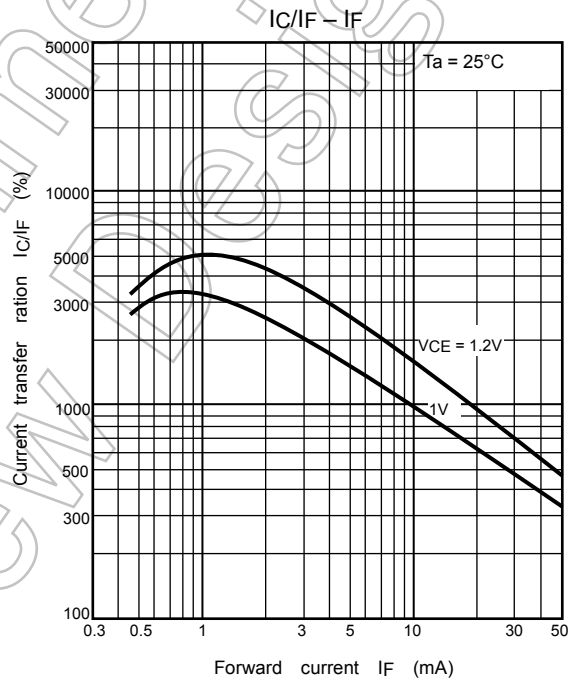
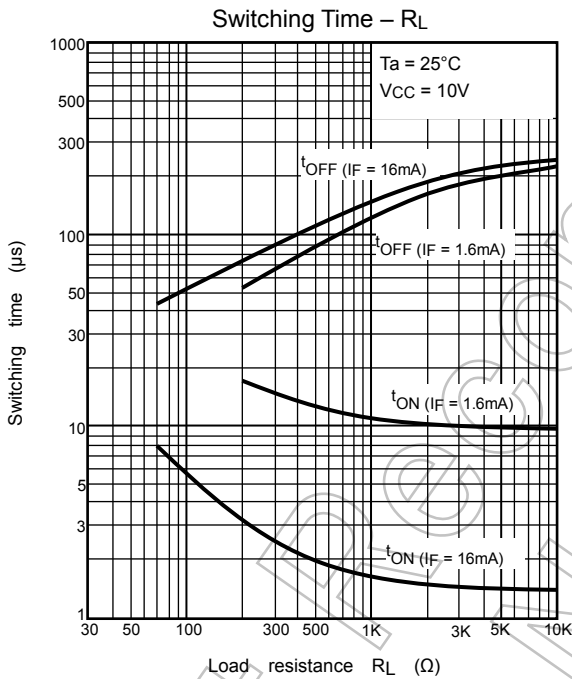
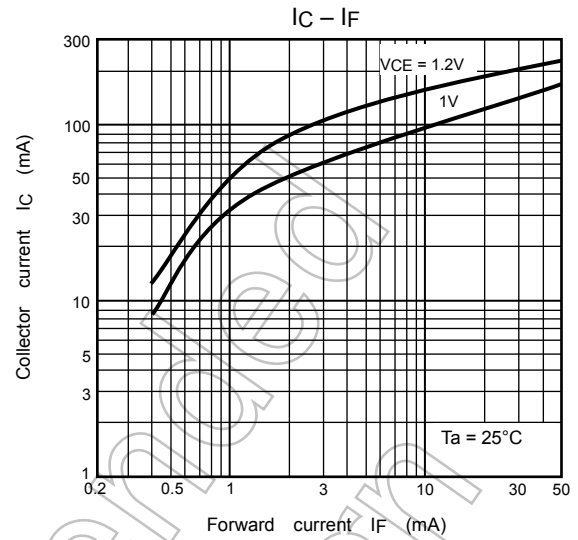
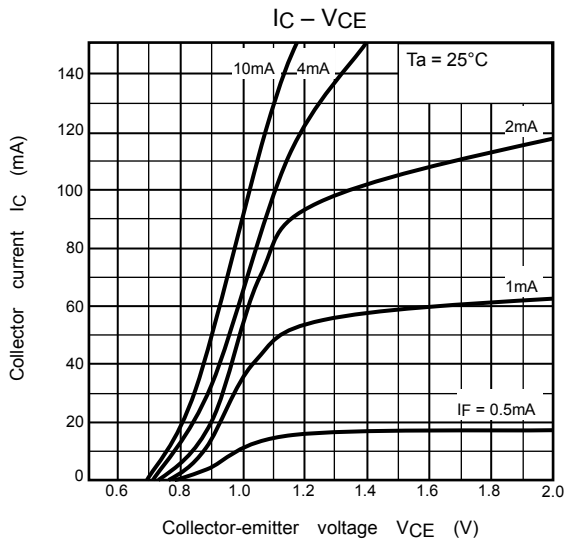
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10 V I <sub>C</sub> = 10 mA R <sub>L</sub> = 100 Ω	—	40	—	μs
Fall time	t <sub>f</sub>		—	15	—	
Turn-on time	t <sub>on</sub>		—	50	—	
Turn-off time	t <sub>off</sub>		—	15	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 180 Ω (Fig.1) R <sub>BE</sub> = OPEN V <sub>CC</sub> = 10 V, I <sub>F</sub> = 16 mA	—	3	—	μs
Storage time	t <sub>s</sub>		—	45	—	
Turn-off time	t <sub>OFF</sub>		—	90	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 180 Ω (Fig.1) R <sub>BE</sub> = 10 MΩ (TLP371) V <sub>CC</sub> = 10 V, I <sub>F</sub> = 16 mA	—	5	—	μs
Storage time	t <sub>s</sub>		—	40	—	
Turn-off time	t <sub>OFF</sub>		—	80	—	

Fig. 1: Switching time test circuit

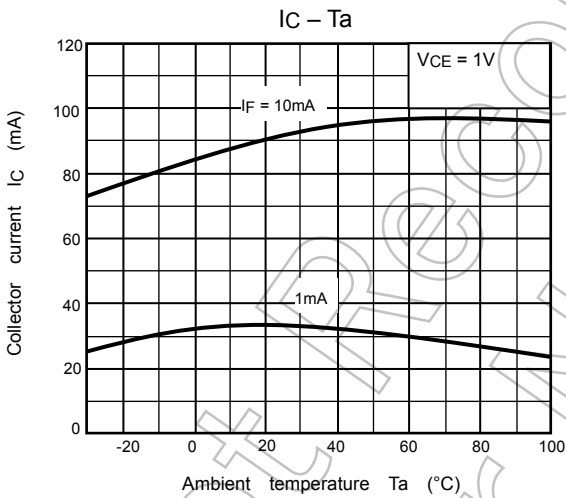
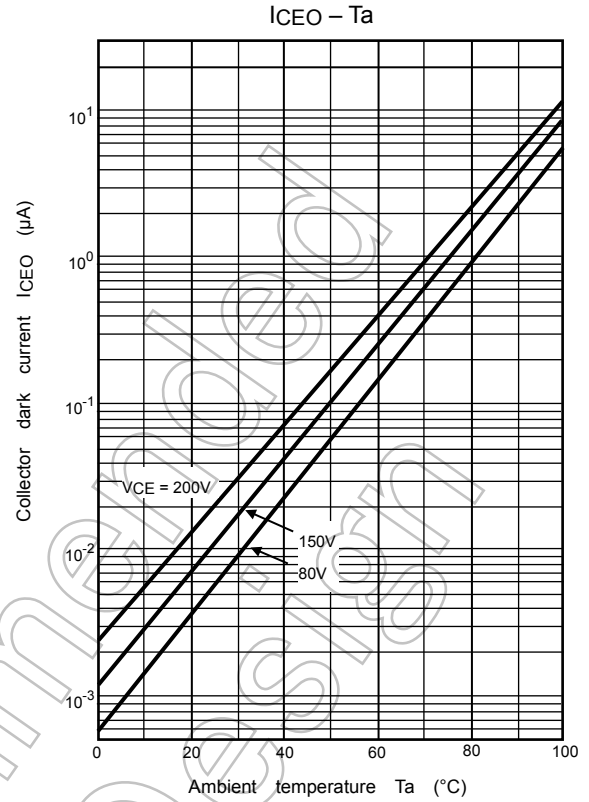
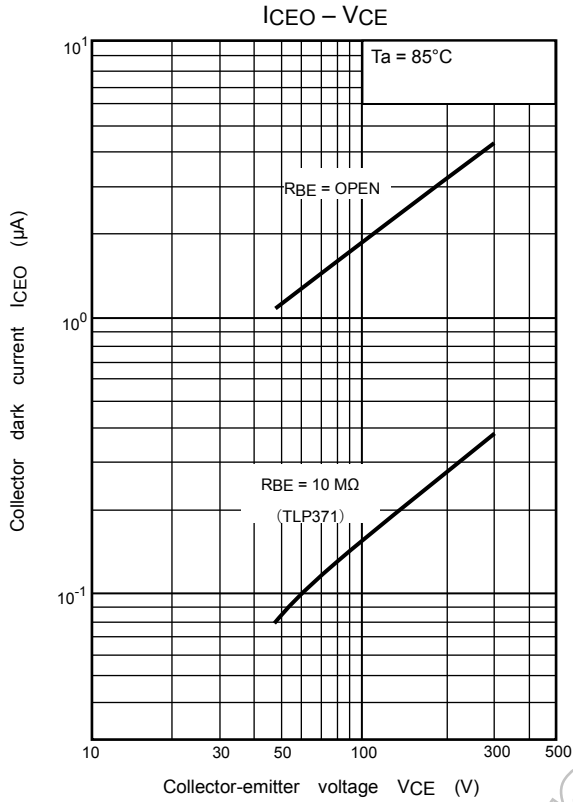




NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



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